California Department of Water Resources
Division of Statewide Integrated Water Management
Water Use and Efficiency Branch

FOURTH TARGET METHOD
PRELIMINARY DWR STAFF ASSESSMENT OF PROPOSED ALTERNATIVES

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The Department of Water Resources (DWR) is required by California Water Code section 10608.20(b)(4) to develop a fourth method that urban water agencies may select to establish urban water use targets for the year 2020. Four alternatives were initially formally proposed for consideration by stakeholders and DWR for the fourth target method. DWR staff provided a preliminary assessment, dated August 23, 2010, of how well these proposals met the U4 Technical Subcommittee charge and evaluation criteria. Since then new or revised alternatives have been proposed and evaluated. The purpose of this document is to provide a preliminary assessment of the four most viable alternatives that are being considered.

At the October 22, 2010, meeting of the SBX7 7 Urban Stakeholder Committee (USC) meeting, DWR presented two alternatives, identified below as BMP Calculator and DWR II alternatives. DWR was requested to conduct additional analyses on these two alternatives. Since then there have been discussions between DWR and the California Urban Water Conservation Council (CUWCC). It became apparent that two hybrid concepts might improve upon the BMP Calculator and DWR II alternatives. Data from the analyses of the hybrid alternatives along with further analyses of the BMP Calculator and DWR II alternatives will be presented to the USC. A preliminary assessment of the four alternatives is presented below.

Criteria

Seven criteria are specified in section 10608.20(b)(4) to guide DWR in developing this method. In addition, three additional criteria were identified in the "Urban Stakeholder Committee, U4 Technical Subcommittee, Charge and Evaluation Criteria," dated 26 May 2010. The first seven below are quoted from the law.

1. Statewide Savings: "The method developed by the department shall identify per capita targets that cumulatively result in a statewide 20-percent reduction in urban daily per capita water use by December 31, 2020." This criterion is the basic requirement for the fourth target method. The assessment for this criterion in the table that follows is based on the ability to estimate the statewide cumulative savings to demonstrate that a proposed methodology can satisfy this requirement.
2. Climatic Differences: "Consider climatic differences within the state."
3. Population Density: "Consider population density differences within the state."
4. Flexibility: "Provide flexibility to communities and regions in meeting the targets."
5. Plant Water Needs: "Consider different levels of per capita water use according to plant water needs in different regions."

6. Different CII (commercial, industrial, and institutional) Use: "Consider different levels of commercial, industrial, and institutional water use in different regions of the state."
7. Undue Hardship: "Avoid placing an undue hardship on communities that have implemented conservation measures or taken actions to keep per capita water use low."
8. Different from 3 Specified Methods: That the method be different from the three legislatively defined methods.
9. Cost of Data Collection: The cost and expense to collect the data required to implement the method.
10. Ease of Implementation: Ease of implementation by the water supplier.

The ten criteria above are not listed in an order of priority, other than number 1, which is an over-arching requirement for the fourth target method. Criteria 2 through 7 are listed in the order described in the law. Note that "consider" as used in the above criteria does not mean that the method contain a specific calculation or adjustment for the given factor. It means that the factor will be considered with respect to the proposal using such factors as relevancy, importance, how the factor may be mitigated in other ways, or overall equity. The strengths and weaknesses of each proposed alternative for each of the criteria will be assessed. Salient strengths or weaknesses in any one or more criteria may influence DWR's overall assessment and choice of a methodology.

Regarding the flexibility criterion, number 4 in the list above, the law does not require that water suppliers implement water conservation in the same manner as their targets are determined. Regardless of which method a water supplier selects to establish its 2020 target, the supplier has the flexibility to use any means of water conservation or water recycling to achieve compliance with the target. The methodology used to calculate the target does not govern how the target is met. In this respect, any option DWR adopts for the fourth target method will have the same flexibility. Also, suppliers have the flexibility to choose which of the four target methods to use.

Basis for Computational Analyses

Each of the four alternatives was analyzed in detail by applying its methodologies to a random sample of 31 water suppliers to the extent that data were available. The computational results from these analyses are the basis for this preliminary assessment. Approximately 400 water suppliers meet the definition of "urban retail water supplier" as defined in section 10608.12(p) of the Water Code and will be subject to the provisions requiring per capita water use targets for the year 2020. The random sample is listed in Table 1 with associated information. Computations were run using data for 2005 as a baseline because data were most accessible for this year and 2005 was the baseline used for the "20x2020 Water Conservation Plan" released February 2010. Because a different methodology is incorporated into the DWR II alternative, it was necessary to rely on data from DWR's Public Water System Statistics Survey (usually abbreviated PWSS) and use an average baseline for the period 2000-2009 instead of a single year 2005.

Three of the four proposals currently being considered use a "BMP Calculator". The calculator was designed to estimate the potential per capita water use savings that could be obtained by implementation of certain best management practices (BMPs) and other water management practices. The calculator contains assumed values and computational procedures based on

experience and research literature that, when combined with data specific to a water supplier, can compute the resulting savings by the year 2020. The BMP Calculator was run for the 31 sample suppliers for a 2005 baseline year. The BMPs or water management practices that are evaluated in the calculator are listed in Table 2. The one of the three proposals relying on the calculator does not use the results from all of the BMPs or practices in the calculator. While the BMPs in the calculator are based on the Memorandum of Understanding (MOU) of the CUWCC, they have been modified to simplify the analysis or increase the coverage or saturation levels expected by 2020. While the CUWCC MOU allows an agency to claim an exemption from a BMP on the basis of cost-effectiveness, such an exemption is not allowed in the calculator.

Whether the random sample is representative of the total number of water suppliers that will be subject to the law depends on several characteristics of the sampled suppliers in relation to the total number of suppliers. Because of climatic differences between hydrologic regions, the representation of the sample in each of the ten hydrologic regions may be important. Also, because membership in CUWCC may indicate a stronger than average implementation of water conservation practices, the representation of the sample in CUWCC may be an indication of a representative sample. The distributions of the random sample by hydrologic region and CUWCC membership status are presented in Tables 3 and 4. The number of samples may be increased in the final analysis to increase to overall confidence level of the sample. In addition, techniques may be employed to adjust the results of the sample to normalize the sample for factors of regional and CUWCC membership representation.

For most water suppliers, the baseline will be a continuous 10-year period within the years 1995-2010. The midpoints of the baseline periods will be between December 31, 1999-December 31, 2005. Many agencies have stated that they will probably select their baseline period toward the earlier part of the spectrum of years allowed. Thus, the year 2000 may be a more representative year than 2005 to simulate the alternative target methods. Further analyses of the random samples will be conducted using 2000 as the baseline year.

Description of Alternatives

The four alternatives that are under current consideration and will be assessed are described below. The procedures described below are based on a certain conceptual approach for setting targets. The procedures for settings targets do not determine how a water supplier has to achieve the targets. A water supplier may use any water conservation or water management measures, including the use of recycled water, to reduce urban potable water use.

1. BMP Calculator

The BMP alternative relies primarily on the ten elements in the BMP Calculator. Because savings from implementation of these BMPs or water management practices will not be sufficient to achieve an overall statewide average savings of 20 percent by 2020, an adjustment factor is added to the savings calculated from the BMP Calculator to determine the target savings for each water supplier such that the statewide average will achieve the statewide target. The adjustment factor under current consideration is proportional to the savings calculated by the BMP Calculator. The adjustment factor is based on the aggregate results of the random sample.

2. DWR II

The DWR II alternative involves dividing water use into three sectors: 1) indoor residential; 2) commercial, industrial, and institutional (CII); and 3) all other, which is presumed to be primarily outdoor use but also including water system losses. Water suppliers are expected to reduce their baseline indoor residential water use to 55 gallons per capita per day (GPCD) by 2020. CII water use is expected to be reduced by 10 percent by 2020. After calculating the expected savings from indoor residential and CII use, the water system losses and outdoor use is expected to be reduced by a uniform percentage statewide to result in a total per capita savings of 20 percent. The uniform percentage is based on the aggregate results of the random sample. Because climate is known to affect outdoor water use, a procedure is incorporated to normalize each water supplier's outdoor use and system losses using reference evapotranspiration (ETo) and effective precipitation factors.

3. Hybrid A

The Hybrid A alternative incorporates elements of DWR II and the BMP alternatives. Water use is divided into two components: 1) water use equal to or below 100 GPCD, which is presumed to capture all indoor residential use as well as some or all CII, system water losses, and outdoor use, and 2) water use above 100 GPCD, which is presumed to be primarily outdoor use, but may contain CII and water system losses. For the component below 100 GPCD, water suppliers are expected to achieve the savings determined by the BMP Calculator for the ten elements. For the component above 100 GPCD, a statewide savings factor is applied by each water supplier such that the average statewide savings will achieve the 20 percent target. For water suppliers with a total water use less than 100 GPCD, baseline water use is expected to be maintained until 2020 without any additional savings. The statewide savings factor is based on the aggregate results of the random sample. Because climate is known to affect outdoor water use, a procedure is incorporated to normalize each water supplier's outdoor use and system losses using reference evapotranspiration (ETo) and effective precipitation factors. The basis for the 100 GPCD threshold in this alternative is consistency with Water Code section 10608.22, which exempts water suppliers with a baseline of less than or equal to 100 GPCD from applicability of that section.

4. Hybrid B

The Hybrid B alternative incorporates elements of DWR II and the BMP alternatives. Water use is divided into three use sectors: 1) water use equal to or below 70 GPCD, which is presumed to capture most or all of indoor residential water use but may include some portion of outdoor use and system water losses; 2) CII water use, which often includes landscape use associated with CII sites and which may include multi-family residential use; and 3) all other water uses, which are presumed to be primarily outdoor use but also including system water losses and, potentially, a small portion of indoor residential use if indoor use exceeds 70 GPCD. Water suppliers are expected to achieve the savings, as determined by the BMP Calculator, for installing water meters for all customers. For the indoor water use sector (the portion of use below 70 GPCD), suppliers are expected to achieve the savings as determined by the BMP Calculator for the

indoor elements, items 3, 7, 8, 9, and 10. For the CII sector, a ten percent savings by 2020 is expected. For the remaining sectors (primarily outdoor use and system losses), a statewide savings factor is applied by each water supplier such that the average statewide savings will achieve the 20 percent target. The uniform percentage is based on the aggregate results of the random sample. Because climate is known to affect outdoor water use, a procedure is incorporated to normalize each water supplier's outdoor use and system losses using reference evapotranspiration (ETo) and effective precipitation factors. The 70 GPCD threshold is based on a finding in an AWWA Research Foundation study, *Residential End Uses of Water*, that average indoor residential water use was 69.3 GPCD.[1]

Preliminary Assessment

DWR's assessment of these four proposed alternatives is presented in Table 5. The lists of data needs shown for criterion 9 are not intended to be comprehensive.

[1] Mayer, P. W., et al., *Residential End Uses of Water*, AWWA Research Foundation and American Water Works Association, Denver, CO, 1999.

Table 1. Water Suppliers in Random Sample

Water Supplier	Hydrologic Region	2005 Population	CUWCC Member as of 2010	Year Signed CUWCC MOU
Anaheim, City of, PUD	South Coast	341079	Y	1991
Azusa, City of, Light and Power	South Coast	48189	N	
Camarillo, City of	South Coast	46981	Y	1991
Camrosa WD	South Coast	27851	Y	1994
Carpenteria Valley Water District	Central Coast	14284	Y	1996
Chino Hills, City of	South Coast	77678	Y	2006
Clovis, City of	Tulare Lake	89972	N	
Crescent City, City of	North Coast	14000	N	
El Monte, City of	South Coast	16353	N	
Folsom, City of	Sacramento River	66242	Y	2004
Livingston, City of (w/o industrial)	San Joaquin River	14135	N	
Madera, City of	San Joaquin River	50581	N	
Mesa Consolidated WD	South Coast	111737	Y	1994
Newport Beach, City of	South Coast	79320	Y	2005
Oroville, California Water Service Company -	Sacramento River	9870	Y	1991
Pittsburg, City of	San Francisco Bay	62189	Y	1995
Rainbow MWD	South Coast	17750	Y	2009
Redding, City of	Sacramento River	88333	N	
Rincon Del Diablo MWD	South Coast	28200	Y	1991
San Bernardino, City of	South Coast	173359	N	
San Francisco PUC	San Francisco Bay	793403	Y	1991
San Luis Obispo, City of	Central Coast	44687	Y	1991
Santa Margarita WD	South Coast	150759	N	
Santa Monica, City of	South Coast	90576	Y	1991
Santa Paula, City of	South Coast	29500	N	
Seal Beach, City of	South Coast	25387	Y	2002
Simi Valley, Golden State Water Company -	South Coast	41994	Y	1991
South Gate, City of	South Coast	101439	N	
Stockton, City of, Mun Util Dept	San Joaquin River	128600	Y	2006
Vallecitos WD	South Coast	73820	Y	1991
Western MWD	South Coast	63383	Y	1994

Table 2. Water Management Practices Included in BMP Calculator

Item #	Water Management Practice	Targeted Water Use Sector
1	BMP 1.2 Water Loss Control	Distribution system losses before delivery
2	BMP 1.3 Metering	Multi-sector
3	BMP 3.1 Residential Assistance	Indoor residential
4	BMP 3.2 Residential Landscape	Outdoor residential
5	BMP 4 CII	CII
6	BMP 5.2 Landscape Budgets	Primarily outdoor use associated with CII sites (dedicated irrigation meters only)
7	Single Family Toilets	Indoor residential
8	Multi Family Toilets	Indoor residential
9	Residential Washers	Indoor residential
10	Residential Showerheads	Indoor residential

Table 3. 2005 Population Distribution of Random Samples

Region Number	Hydrologic Region	2005 Random Sample			2005 Total Population	
		Hydrologic Region Population	% of Statewide Sample	% of Total HR or State Population	Hydrologic Region Population	% of Statewide Population
1	NC	14,000	0.5%	2.1%	673,669	1.8%
2	SF Bay	855,592	29.3%	13.4%	6,404,503	17.5%
3	CC	58,971	2.0%	3.8%	1,534,971	4.2%
4	SC	1,545,355	52.9%	7.9%	19,489,176	53.2%
5	SR	164,445	5.6%	5.7%	2,902,348	7.9%
6	SJR	193,316	6.6%	9.8%	1,978,183	5.4%
7	TL	89,972	3.1%	4.4%	2,067,314	5.6%
8	NL	0	0.0%	0.0%	106,103	0.3%
9	SL	0	0.0%	0.0%	783,854	2.1%
10	CR	0	0.0%	0.0%	704,861	1.9%
Total		2,921,651	100.0%	8.0%	36,644,983	100.0%

Table 4. 2000 CUWCC Membership (2005 not analyzed)*

Membership Status	Random Sample		All Suppliers	
	# Suppliers	%	# Suppliers	%
Members	14	45.2	163	41.8
Non-Members	17	54.8	227	58.2
Total	31	100.0	390	100.0

*Note: Population distribution by CUWCC membership status is not available.

Table 5. Preliminary Assessment based on Evaluation Criteria

Alternative	BMP Calculator	DWR II	Hybrid A	Hybrid B
1. Statewide Savings	20% savings will be achieved if the BMP savings adjustment factor is accurate, which is dependent on how well the random sample represents all suppliers.	20% savings will be achieved if the landscape and water loss savings factor is accurate, which is dependent on how well the random sample represents all suppliers.	20% savings will be achieved if the landscape and water loss savings factor for use over 100 GPCD is accurate, which is dependent on how well the random sample represents all suppliers.	20% savings will be achieved if the landscape and water loss savings factor is accurate, which is dependent on how well the random sample represents all suppliers.
2. Climatic Differences	The BMP Calculator does not address outdoor water use savings well. The statewide adjustment factor is based on the calculator savings.	The statewide adjustment factor is applied to the combined outdoor and systems losses sector, thus giving significant weight to outdoor use. ETo and effective precipitation factors normalize outdoor water use by climate.	The statewide adjustment factor is applied to all use above 100 GPCD, which is primarily outdoor use. ETo and effective precipitation factors normalize the outdoor and system losses water use by climate. This alternative does not identify outdoor water use as explicitly as the DWR II or Hybrid B alternatives.	The statewide adjustment factor is applied to the portion of use above 70 GPCD and CII use, which is primarily outdoor and system losses. ETo and effective precipitation factors normalize the outdoor and system losses water use by climate.
3. Population Density	Population density appears to be an indirect reference to per capita irrigated area. The BMP Calculator does not address outdoor water use savings well.	Population density appears to be an indirect reference to per capita irrigated area. While DWR II relates a significant portion of savings to outdoor use, it does not reflect differences in per capita irrigated area.	Population density appears to be an indirect reference to per capita irrigated area. While Hybrid A relates a significant portion of savings to outdoor use, it does not reflect differences in per capita irrigated area.	Population density appears to be an indirect reference to per capita irrigated area. While Hybrid B relates a significant portion of savings to outdoor use, it does not reflect differences in per capita irrigated area.
4. Flexibility	Suppliers have complete flexibility to decide measures to meet targets regardless of target method chosen.	Suppliers have complete flexibility to decide measures to meet targets regardless of target method chosen.	Suppliers have complete flexibility to decide measures to meet targets regardless of target method chosen.	Suppliers have complete flexibility to decide measures to meet targets regardless of target method chosen.

Table 5. Preliminary Assessment based on Evaluation Criteria

Alternative	BMP Calculator	DWR II	Hybrid A	Hybrid B
5. Plant Water Needs	BMP 5.2 identifies savings from water budgets for dedicated landscape metered deliveries for which no budgets have been provided. However, the BMP Calculator does not address most outdoor use.	DWR II relates a significant portion of savings to outdoor use, which is normalized by ETo and effective precipitation.	Hybrid A relates a significant portion of savings to outdoor use, though potentially less accurately than DWR II or Hybrid B. Outdoor use is normalized by ETo and effective precipitation. Not all outdoor use is isolated; some is embedded in the portion of use under the 100 GPCD threshold.	Hybrid B relates a significant portion of savings to outdoor use, which is normalized by ETo and effective precipitation. Not all outdoor use is isolated; some is embedded within the CII sector and in the portion of use under the 70 GPCD threshold.
6. Different CII Use	The BMP Calculator alternative assumes 10 percent savings on total baseline CII use, but does not distinguish between types of CII use or past CII savings.	The DWR II alternative assumes 10 percent savings on total baseline CII use, but does not distinguish between types of CII use or past CII savings.	The Hybrid A alternative assumes 10 percent savings on total baseline CII use, but does not distinguish between types of CII use or past CII savings. Because CII savings is not correlated to a separate CII use sector, some CII water use falling within the use above 100 GPCD could be subject to additional savings.	The Hybrid B alternative assumes 10 percent savings on total baseline CII use, but does not distinguish between types of CII use or past CII savings.

Table 5. Preliminary Assessment based on Evaluation Criteria

Alternative	BMP Calculator	DWR II	Hybrid A	Hybrid B
7. Undue Hardship	The BMP Calculator gives credit for past conservation in indoor residential, dedicated irrigation meter budgeting, and metering. Savings from past foundational BMPs are not determined.	Suppliers that have reduced indoor residential use closer to the 55 GPCD target will have less hardship achieving that. Because the statewide savings factor is applied to outdoor use and water losses, past reductions in those will be reflected in reduced savings requirements.	The BMP Calculator gives credit for past conservation in indoor residential, dedicated irrigation meter budgeting, and metering. Savings from past foundational BMPs are not determined. However, by requiring only BMP Calculator savings for use below 100 GPCD, it is likely that a significant portion of past conservation is captured, especially because reportedly most urban conservation efforts have emphasized indoor use. Because the statewide savings factor is applied to use over 100 GPCD, which is mostly outdoor use and water losses, past reductions in those will be reflected in reduced savings requirements.	The BMP Calculator gives credit for past conservation in indoor residential and metering. Savings from past foundational BMPs are not determined. However, by requiring only BMP Calculator savings for use below 70 GPCD, it is likely that a significant portion of past conservation is captured, especially because reportedly most urban conservation efforts have emphasized indoor use. Because the statewide savings factor is applied to outdoor use and water losses, past reductions in those will be reflected in reduced savings requirements.
8. Different from 3 Specified Methods	This alternative is very different from the 3 methods specified in Water Code, except that CII savings is 10% as in Method 2.	DWR II has similarities to Method 2 for indoor residential and CII use, but relies on determining indoor residential use as a means to determining outdoor use. Calculation of irrigated landscape area is not required in DWR II.	This alternative is very different from the 3 methods specified in Water Code, except that CII savings is 10% as in Method 2.	This alternative is very different from the 3 methods specified in Water Code, except that CII savings is 10% as in Method 2.

Table 5. Preliminary Assessment based on Evaluation Criteria

Alternative	BMP Calculator	DWR II	Hybrid A	Hybrid B
9. Cost of Data Collection	There are many inputs to the BMP Calculator that many suppliers will not have readily available. Additional water suppliers will have to be added to the random sample for DWR to determine reliable baseline data and statewide adjustment factor. The random sample will have to be run for baseline 2000. Data Needs: Using the BMP Calculator: baseline water use, baseline unmetered accounts, past number of residential customers receiving indoor and outdoor use assistance, number of past water budgets provided for dedicated landscape meters, number of past single-family accounts receiving clothes washer incentives, number of residential toilet replacement incentives provided in past.	DWR II needs monthly water use data for water suppliers to estimate their own indoor water use and for DWR for each supplier in random sample to estimate indoor use and statewide adjustment factor. ETo and effective precipitation data are needed for each supplier.	There are many inputs to the BMP Calculator that many suppliers will not have readily available. Additional water suppliers will have to be added to the random sample to determine reliable baseline data and statewide adjustment factor. The random sample will have to be run for baseline 2000. ETo and effective precipitation data are needed for each supplier. Data Needs: Using the BMP Calculator: baseline water use, baseline unmetered accounts, past number of residential customers receiving indoor and outdoor use assistance, number of past water budgets provided for dedicated landscape meters, number of past single-family accounts receiving clothes washer incentives, number of residential toilet replacement incentives provided in past.	There are many inputs to the BMP Calculator that many suppliers will not have readily available. Only 7 of 10 elements of BMP Calculator used, reducing somewhat the number of inputs. Additional water suppliers will have to be added to the random sample to determine reliable baseline data and statewide adjustment factor. The random sample will have to be run for baseline 2000. ETo and effective precipitation data are needed for each supplier. Data Needs: Using the BMP Calculator: baseline water use, baseline unmetered accounts, past number of residential customers receiving indoor use assistance, number of past single-family accounts receiving clothes washer incentives, number of residential toilet replacement incentives provided in past.
10. Ease of Implementation by Water Supplier	There are many inputs to the BMP Calculator that many suppliers will not have readily available.	Suppliers need monthly water use data to estimate their own indoor water use	There are many inputs to the BMP Calculator that many suppliers will not have readily available.	There are many inputs to the BMP Calculator that many suppliers will not have readily available.

Table 5. Preliminary Assessment based on Evaluation Criteria

Alternative	BMP Calculator	DWR II	Hybrid A	Hybrid B
Other Comments		Implementation is significantly hampered by the inability to determine indoor residential use accurately. Minimum month methods do not appear to be accurate and over-estimate indoor use in arid areas where winter irrigation takes place. DWR II does not rely on the BMP Calculator, which could simplify the ability of suppliers to calculate targets and simplify DWR review.		